Regenerative Agricultural Management

- Tillage reduction
- Maximized soil cover to maintain photosynthesis
- Increased biodiversity
- Improved nutrient cycling
- Increase water use efficiency and infiltration
- Animal integration
- Increase terrestrial carbon stocks across the farm (soils, trees, etc.)

Synergy of practices that achieve the following goals:
Tillage Reduction Practices: Organic No-Till with Rolling & Crimping
Organic No-Till Soybeans
Frost-Seeding and Undersowing Cover Crops
Biodiversity: Cover Cropping
Biodiversity: Diversification of Crop Rotation

Stone House Farm’s Crop Rotation

- Corn
- Soybeans
- Small Grain (Wheat, Barley, Oats)
- 2-3 Year Perennial Seed-Down For Pasture & Hay

Alternate Crops: Sunflower, Buckwheat, Field Peas, Fiber Hemp, CBD Hemp
Nutrient Management: Compost & Compost Tea
Animal Integration: Grazing
Keyline Design & Agroforestry

- Increased soil C stocks
- Increased C stocks in woody biomass
- Increased water use efficiency and infiltration
- Decreased Compaction
Agroforestry: Tree Planting Plan for SHF
Research

Measuring Carbon and Nitrogen Flux in:

- Soil
- Plant Biomass
- Atmosphere
- Water
Biomass Sampling
Soil Core Sampling to a Depth of One Meter

• Core is divided into 5 horizons, at 10cm, 20cm, 30cm, 60cm, & 100cm.
Eddy Covariance Method

Provides continuous, high-frequency, spatially integrated measurements of GHG’s across a large footprint area.
Streamflow Monitoring for Drainage Swales and Streams

Data set:
Flow Volume
Velocity

Quality Parameters:
Dissolved Oxygen
Dissolved Organic Matter
pH/Temperature
Nitrate
Ammonium
Large-Scale Monitoring for Change in Carbon Stocks

Multi-Faceted Approach

• Remote Sensors
• On-The-Go Soil Variability Scanners
• Soil Profile Spectroscopy
On-The-Go Soil Variability Mapping

Electrical Conductivity Sensor coupled with a Spectrophotometer that measures visual and near-infrared reflectance
Zone Sampling for Variable Rate Prescriptions based on Satellite Imagery
Soil Profile Mapping: EC, SOM, Compaction
Solar Induced Fluorescence

- SIF is an energy by-product of photosynthesis, and therefore can be used as a proxy measurement to calculate the rate of photosynthesis.
- We are working on micronizing solar-induced fluorescence sensors to mount on a UAV, so that we can periodically measure SIF remotely over large areas.
Nutrient Management: Cover Crops

Yield Map:
• Green -260-380 bu/ac
• Yellows – 170-200 bu/ac
• Oranges – 110-170 bu/ac
• Red – 10-110 bu/ac
• Field Average: 180 bu/ac

Left Side had a cover of clover which had greater yields than the right side, which had a multi-species cover crop mix.
Conventional vs. Organic Nitrogen Management:
Corn, 2018

<table>
<thead>
<tr>
<th>Conventional Farm</th>
<th>Organic Farm (SHF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Type:</td>
<td>Fine Sandy Loam</td>
</tr>
<tr>
<td>Product</td>
<td>Date</td>
</tr>
<tr>
<td>Urea</td>
<td>6/27/19</td>
</tr>
<tr>
<td>Nitrate</td>
<td>6/27/19</td>
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<tr>
<td>Total</td>
<td>160 lbs N/ac</td>
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<tr>
<td>Yield</td>
<td>194 bu/ac</td>
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<tr>
<td>Total N per</td>
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</tr>
<tr>
<td>Bushel Yield</td>
<td>0.82 lbs N/bushel</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>Fine Sandy Loam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>Date</td>
</tr>
<tr>
<td>Composted</td>
<td>5/2/18</td>
</tr>
<tr>
<td>Poultry Litter</td>
<td>5/30/18</td>
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<tr>
<td>7-1-7 Custom</td>
<td>7/02/18</td>
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<tr>
<td>Total</td>
<td>81.5 lbs N/ac</td>
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<tr>
<td>Yield</td>
<td>111 bu/ac</td>
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<tr>
<td>Total N per</td>
<td></td>
</tr>
<tr>
<td>Bushel Yield</td>
<td>0.73 lbs N/bushel</td>
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</tbody>
</table>

In 2018, the average corn yield across Stone House Farm was **130 bu/ac**, and the average rate of N application was **80 lbs/ac**.
## Conventional vs. Organic Nitrogen Management: Corn, 2018

<table>
<thead>
<tr>
<th></th>
<th>Conventional Site</th>
<th>Organic Site (SHF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic Matter</td>
<td>1.85%</td>
<td>2.08%</td>
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<tr>
<td>CEC</td>
<td>4.75</td>
<td>5.21</td>
</tr>
</tbody>
</table>
Conventional vs. Organic Nitrogen Management: Corn, 2018
Thank You!